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DIRECTORATE OF
INTELLIGENCE

Intelligence Memorandum

POSSIBLE ALTERNATIVES TO THE ROLLING THUNDER PROGRAM

(THE CASE WHERE THERE IS A COMPLETE CESSATION OF BOMBING IN NORTH VIETNAM, WITH INCREASED ATTACKS AGAINST INFILTRATION ROUTES IN LAOS.) (NO. 8)

JCS review completed.

DIA review(s) completed.

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CENTRAL INTELLIGENCE AGENCY
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POSSIBLE ALTERNATIVES TO THE ROLLING THUNDER PROGRAM

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Summary

This memorandum examines the effects of shifting the weight of the present Rolling Thunder campaign to Laos. There would be a complete cessation of bombing in North Vietnam itself.

A bombing campaign confined to Laos would be directed solely at transportation-logistic targets, since that country's military significance derives very largely from its role as the key infiltration corridor to South Vietnam from the north. However, the transportation-logistic systems in Laos are less attractive targets than their counterparts in North Vietnam, even including the present restricted Vietnamese Panhandle system, which is confined to targets below the 19th Parallel as a consequence of a self-imposed US restriction. The Laotian transport system is a more rudimentary one than the North Vietnamese system. It has a small and declining number of significant logistic targets that are susceptible to detection and attack from the air, and as a consequence, the post-attack repair problems are considerably less burdensome. We believe that concentrating the air effort

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against Laos would have the following direct effects:

1. Increased numbers of trucks, supplies, roads, and bridges in Laos would be destroyed or neutralized, particularly if the United States continues to enhance its capabilities of carrying out night air operations. However, expansion of the capacity of the transporation routes in Laos will soon permit the throughput of 1,000 tons of supplies per day during the dry season and 200 tons during the wet season, in the absence of bombing attacks. The road network is used to only a small share of its capacity; we do not estimate that increased bombings would be able to slow down the present high level of infiltration of men or supplies.

2. The weather and availability of suitable aircraft would impose serious constraints in utilizing the available aircraft sortie capability now devoted to attacking North Vietnam. In 1967, more than twice as many attack sorties were flown against North Vietnamese targets as against those in Laos. But instead of a 200-percent increase in attack sorties, we estimate that the actual increase from the proposed shift to Laos would be closer to 50 percent. Under these circumstances, the present rapid repair schedule could be maintained by the shifting of a small number of repair crews -- not more than 5,000 men -- to Laos from North Vietnam.

3. The North Vietnamese, as soon as they were convinced that the bombing lull over North Vietnam was to be prolonged, would begin shifting more antiaircraft weapons into Laos. Most of these weapons, we believe, would be of small caliber with a few larger conventional antiaircraft guns and perhaps a token number of SAM's. When completed, this shift could triple the present

low loss rate of US aircraft operating against Laotian targets to a level closely approximating that experienced against North Vietnamese targets.

The cessation of bombing attacks on North Vietnam, even though attacks on Laos continued, would be regarded in Hanoi as a propaganda and political victory. The regime would have accomplished one of its major purposes in freeing its territory from aerial attack and it would therefore be encouraged in its belief that the United States would yield to additional pressures. It is unlikely that the proposed shift in the bombing program to Laos would have any significant effect on Hanoi's position with respect to meaningful negotiations with the United States.

I. Air Operations over Laos

A. Character of Previous Operations

Attack sorties over Laos against the Communist infiltration and logistic system, base areas, and other military facilities during the period 1965 through March 1968 totaled 128,000, about one-half the number flown over North Vietnam.* About two-thirds of the attack sorties over Laos during both 1966 and 1967 were flown in the first and fourth quarters, when the weather was relatively good for air operations. The 22,000 sorties flown during the first quarter of 1968 was the highest quarterly total of the war. Attack sorties over Laos, by quarter, are given in the following tabulation:

Quarter	1965	1966	1967	1968
January-March	440	19,820	17,670	21,880
April-June	2,130	14,190	9,440	
July-September	2,760	4,290	4,580	
October-December	5,500	10,180	14,480	
Total a/	*10,840*	*49,120*	*46,160*	

a. Because of rounding and post-yearly corrections, components may not add to the totals shown.

Air operations over Laos are divided between two operational areas: the Barrel Roll area, extending along the North Vietnamese border in northern Laos, and the Steel Tiger area, roughly equivalent to the Laos Panhandle, extending south from Route 8 to the Cambodian border. These areas are further subdivided into seven alphabetically designated sectors, Alpha through Golf (see the map, Figure 1).

** In addition, 90,000 support sorties were flown over Laos during this period. During 1967, about one-half of the support sorties carried out forward air control missions, 20 percent were reconnaissance missions, 12 percent were combat air patrol and refueling missions, and the remaining were supply, defoliation, and search and rescue missions.*

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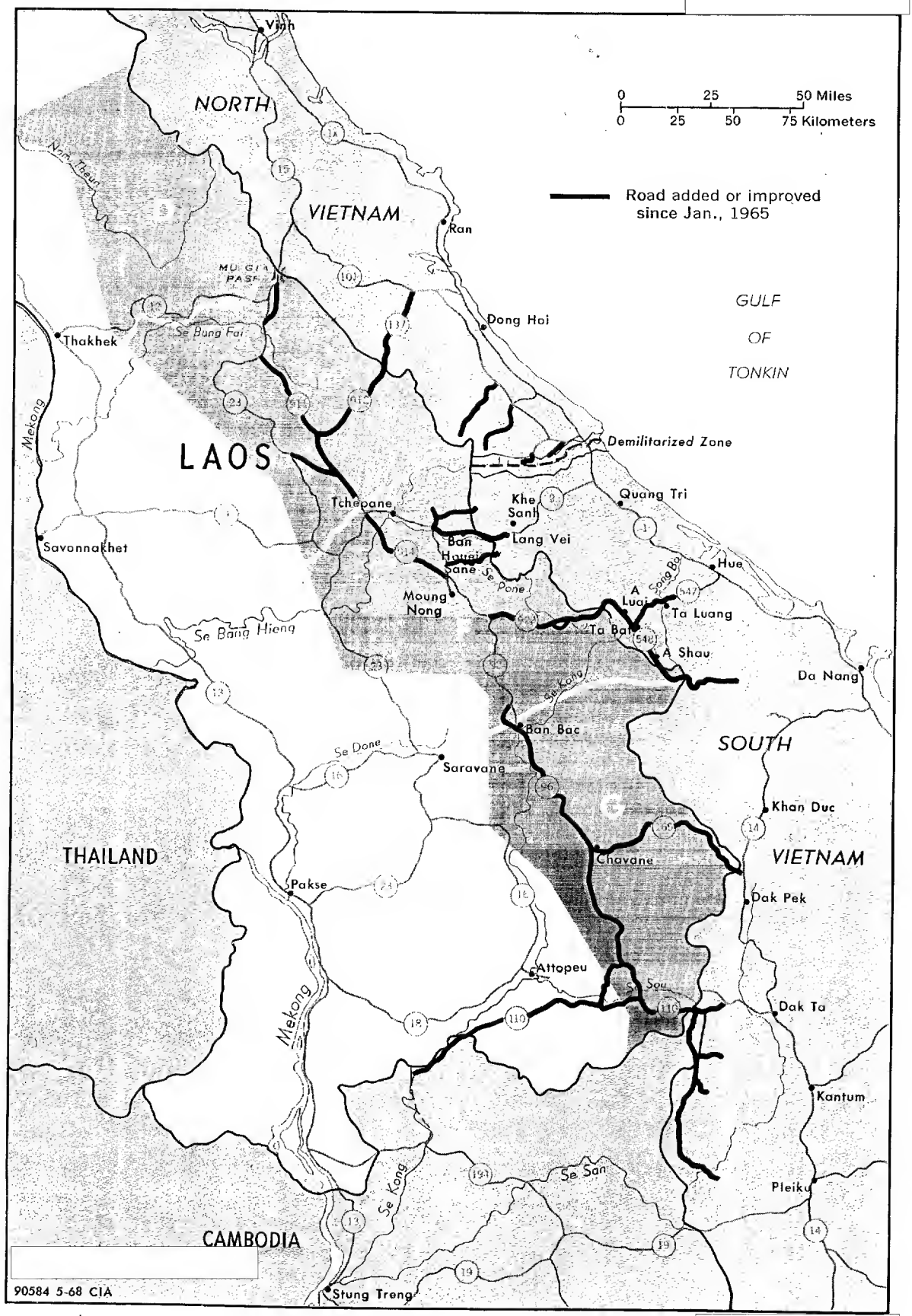

Figure 1. Laos: Road Network and Steel Tiger Boundaries

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About four-fifths of the attack sorties over Laos during 1966 and 1967 were against targets in the Steel Tiger area of the Laotian Panhandle. During the first quarter of 1968, attacks in the Steel Tiger area increased further to almost 90 percent of all attack sorties flown over Laos. During January-March 1968, emphasis within the Steel Tiger area shifted from the Echo sector, adjacent to the major logistical routes from North Vietnam into the Panhandle of Laos, to the Foxtrot sector, just west of the Khe Sanh area of South Vietnam. The share of Steel Tiger attack sorties flown against the Foxtrot sector increased from about 25 percent in 1967 to 50 percent during this period.

Most US sorties continue to be flown during daylight hours, despite the increased use of detection devices (see the Appendix) that have been developed to locate trucks that move largely at night. In 1967 in the Steel Tiger area, there was a ratio of two day sorties to each night sortie. In the fourth quarter of 1967, the ratio changed to one day sortie to each night sortie. However, in 1968 the ratio again returned to two day sorties to each night sortie.

There were 112 combat losses of attack aircraft over Laos during the period 1965 through March 1968.* During 1967, 31 fixed-wing aircraft were downed in Laos by Communist defenses while participating in a total of 46,160 attack sorties -- a loss rate of less than 0.7 aircraft per 1,000 sorties.** Propeller-driven aircraft flew about one-fifth of the attack sorties but sustained almost one-half of the losses by attack aircraft during 1966 and 1967. However, in 1967, attack sorties by propeller-driven aircraft were restricted to less heavily defended areas, and the loss rate

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** In addition, 33 combat losses of support aircraft, and 20 operational losses of attack and support aircraft, were sustained during the period. Total losses from all causes over Laos, therefore, were 165 fixed-wing aircraft.*

*** The comparable loss rate over all of North Vietnam was 2.4 aircraft per 1,000 attack sorties -- more than three times the rate in Laos.*

by these aircraft fell to about one-half of that sustained in 1966. The trend in combat losses of fixed-wing aircraft and corresponding loss rates over Laos during attack missions since 1965 are shown in the following tabulation:

Year	Attack Sorties	Combat Losses of Attack Aircraft	Losses per 1,000 Sorties
1965	10,840	17	1.6
1966	49,120	47	1.0
1967	46,160	31	0.7
Jan-Mar 1968	21,880	17	0.8
Total	*128,000*	*112*	*0.9*

More than three-fourths of the attack sorties against targets in Laos during 1967 were carried out by 11 different types of jet-powered aircraft, mostly F-4's, F-105's, and A-4's. The characteristics of these aircraft -- high speed, high altitude, and high fuel consumption characteristics -- limit their loitering times and target-spotting capabilities and reduce their attack effectiveness against fleeting targets. Accordingly, most jet strikes in Laos during 1967 were against fixed targets such as truck parks, bridges, supply areas, and defense sites.

Three types of propeller-driven aircraft -- A-1's, A-26's, and T-28's -- flew the remaining attack sorties over Laos in 1967. Most attack sorties by propeller-driven aircraft were against trucks and other moving targets. Attack sorties during 1967 by propeller-driven and jet-powered aircraft over Laos and North Vietnam are given in the following tabulation:

Type of Aircraft	Laos	North Vietnam	Laos and North Vietnam Combined
Jet	35,170	103,350	138,520
Propeller	10,990	3,590	14,580
Total	*46,160*	*106,940*	*153,100*

B. Stepped-Up Attacks Against Laos

Weather constraints and the limited availability of suitable aircraft and technical equipment will probably restrict an increase in attack sorties over Laos to perhaps 50 percent above 1967 levels, and many of the additional sorties would be of marginal effectiveness. About 107,000 additional attack sorties could be made available for use over Laos as a result of a bombing pause in North Vietnam. On the basis of a comparison with 1967 Rolling Thunder statistics, however, most of these sorties would be flown by jets: 85 percent by F-4's, F-105's, and A-4's alone. Only about 6,000 of the jet attack sorties would be flown by A-6 aircraft equipped for radar bombing against fixed targets during poor weather and at night, and only about 3,600 attack sorties would be performed by propeller-driven aircraft. Furthermore, heavy rains and low, dense clouds brought by the Southwest Monsoon generally would sharply limit attacks in Laos during a part of each day from approximately mid-May to mid-September, regardless of the potential number of sorties available. Figure 2, which compares average rainfall and attack sorties over Laos, reflects in part the effect of weather on the sortie rate.

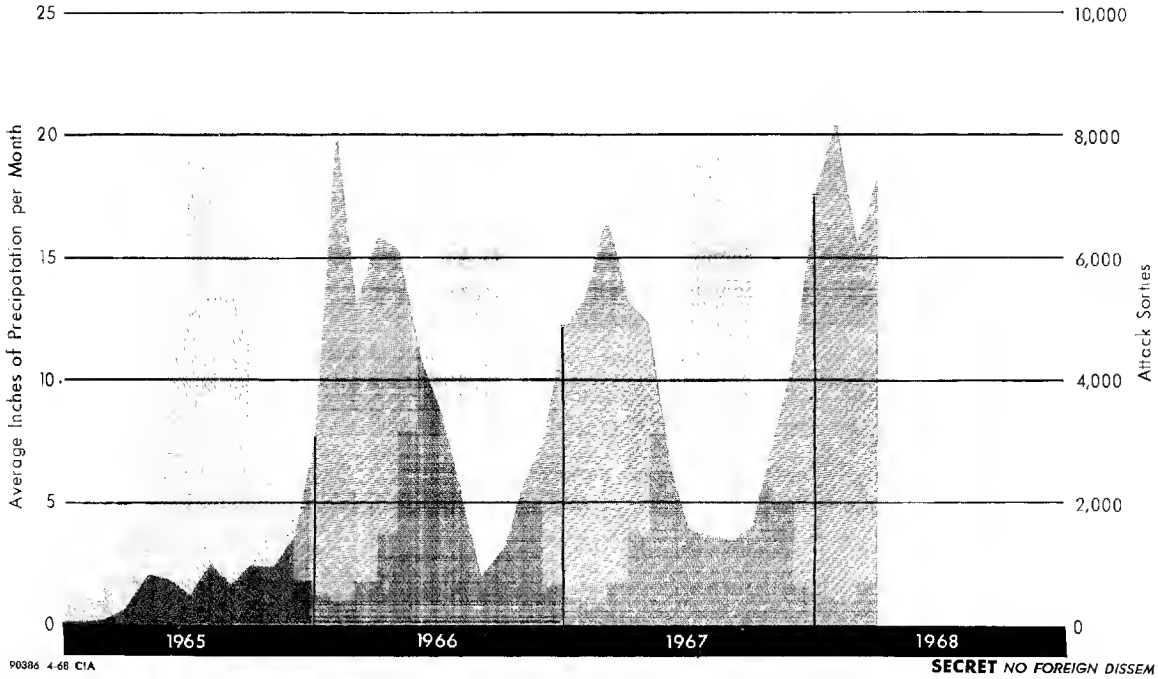

Figure 2. Attack Sorties Compared with Rainfall over Laos, January 1965-March 1968

C. Communist Air Defense

Communist air defenses in Laos are composed of at least 15 antiaircraft battalions, with a total of 3,200 air defense personnel and about 150 to 300 14.5-mm weapons and 250 to 400 weapons of 37-mm or larger. The weapons are mobile and difficult to locate and can be deployed in more remote areas where transportation problems hinder the movement of heavier weapons. The 14.5-mm weapons have a maximum effective range of 4,600 feet and are used against low-flying strike aircraft, drones, and helicopters. The 37-mm weapons have a maximum effective range of 8,200 feet. A few 57-mm weapons with a maximum effective range of 19,600 feet may also be in the Panhandle. Thirteen of the battalions have been identified as Pathet Lao, one as a Deuane/Pathet Lao battalion, and one as a North Vietnamese battalion. A minimum of six battalions, about 40 percent of the total air defense strength in Laos, are known to be located in Southern Laos.

In the event the Rolling Thunder program were halted, the air defense system in the Laotian Panhandle could be readily augmented by redeploying as many as 1,500 antiaircraft weapons and 6,000 antiaircraft personnel from North Vietnam without a serious impairment of North Vietnam's air defense capability. About 60 percent of these could consist of weapons of 37-mm or larger. Such a redeployment could be accomplished within a month and would at least double and possibly triple the number of antiaircraft weapons presently in the Laotian Panhandle. Trucks available in North Vietnam could readily transport the required ammunition, and resupply requirements would not impose a significant burden on the transport system.

Up to five SAM firing battalions and one support battalion could be deployed to the Laotian Panhandle from the Hanoi-Haiphong area without seriously impairing the air defense system in North Vietnam. It is probable that any deployment of SAM's in Laos would be restricted to the Echo and Foxtrot sectors of the Steel Tiger area against which most US air attacks in Laos are concentrated. To support five firing battalions, about 25 SAM sites would probably be built. Construction of

the sites and feeder roads would require up to 2,000 engineering workers and would take at least six weeks to complete. The SAM equipment, weighing 3,000 to 3,500 tons, and personnel, numbering less than 1,000, could easily be moved to these sites during the dry season. A more limited and less rapid movement of SAM equipment could be made during the rainy season.

Although the introduction of SAM's into Laos would have considerably more than a nuisance value, it is doubtful if the SAM's would be an effective air defense system in view of the kind of air war presently being fought in Laos. The SAM's have proved to be relatively more effective in defending industrial and fixed lines of communication (LOC) targets in the Northeastern areas of North Vietnam than the fleeting and widely dispersed targets characteristic of the air war in Laos. It is likely, therefore, that the North Vietnamese would deploy only one or two SAM battalions involving five to ten sites in the Laotian Panhandle, thus providing a threat to US strike forces with a minimum expenditure of resources. A system of this magnitude could be completed in less than three weeks, would involve the movement of around 1,000 tons of SAM equipment, and would require up to 700 construction workers and 350 SAM personnel.

A small MIG effort could be conducted against US aircraft over the Laos Panhandle. MIG's can now be staged from an airfield at Vinh and an airfield under construction at Bai Thuong, but it will take six months before construction of the Bai Thuong airfield can be completely finished.

Aircraft losses as a result of these reinforcements in the defense system could be expected to increase, possibly from the 1967 rate in Laos of 0.7 aircraft per 1,000 attack sorties to a rate closer to the average of 2.4 aircraft per 1,000 attack sorties experienced in North Vietnam.

II. The Logistic System in Southern Laos

A. The Road Network

The great bulk of the logistical supplies moved by the Communists into and through the Panhandle

of Laos is moved by truck. The movements are supplemented by primitive transport -- bicycles, porters, and carts -- on innumerable trails and by small craft on a few minor waterways during the rainy season.

The road system has been progressively expanded and upgraded until it now contains more than 1,600 kilometers of road (see Figure 1). During each dry season, engineer units and laborers construct new roads, bypasses, and fords, and repair and improve existing roads. New road construction is usually halted during the rainy season except for short bypasses to keep the routes open. Since 1964 the Communists have added about 1,300 kilometers of roads to the Laotian network.* The most significant routes completed during this time included a second major access road (Route 137/912) into Laos, a limited all-weather road** (Route 92/96) to the tri-border area, and six roads pushed across the Laotian border into South Vietnam. About 670 kilometers of this construction, consisting of the primary trunk road system, was built in the 1965-66 dry season. During the recent 1967-68 dry season, another major construction effort resulted in about 350 kilometers of new roads, mainly consisting of roads extending eastward into South Vietnam. A third major access road from North Vietnam into Laos is also nearing completion, possibly by May or June of this year. Most of the new roads appear to have limited all-weather capability and should remain open to vehicular traffic for a major part of the rainy season.

Currently, there are an estimated 12,000 full-time workers, including engineering units, assigned to repair and maintain the road net in

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** Included in this total are 68 kilometers of roads in North Vietnam (42 kilometers of Route 137 and 26 kilometers of a new unnumbered road) and 127 kilometers of extensions within South Vietnam.*

*** A limited all-weather road has greatly reduced capability in the rainy season, but with proper construction and appropriate maintenance or repair techniques it remains open for a low level of daily traffic during the rainy season except for occasional periods of a few days.*

the Laotian Panhandle, supplemented by some 4,000 part-time laborers or conscripted villagers. The full-time workers also operate ferries and fords and are responsible for traffic control. At the peak of road construction in Laos in 1965-66, an estimated 25,000 workers, comprised mainly of North Vietnamese army troops, were engaged in road expansion.

Materials utilized in constructing and maintaining the Laotian road net are, for the most part, obtained locally. Small amounts of cement, steel, asphalt, and fuel must come from North Vietnam, but there is no apparent shortage of those items required for the primary routes. Only small numbers of bulldozers, rock crushers, and road graders are in the Panhandle, but additional construction equipment could be easily obtained from equipment parks in North Vietnam. A standdown of the bombing in North Vietnam would probably result in a major effort to improve the all-weather capability of the road system in the Laos Panhandle.

About 10 major Communist base areas and many shelters have been built along the supply routes in the Panhandle. These facilities are often located under heavy tree cover or in caves at least several hundred yards distant from the main road. Their locations can sometimes be detected by determining where the trucks leave the main road. The number of such facilities was greatly increased in 1965 and 1966, probably as a result of a step-up in the war and as a countermeasure to aerial attacks.

A network of fixed wirelines apparently intended for logistics functions has been under rapid construction by the Communists since November 1967 from north of the DMZ, through the Laotian Panhandle, and into South Vietnam. The fixed character of the wirelines, involving laborious clearing of vegetation and mounting of poles, testifies to the extent of the North Vietnamese logistical buildup in Laos. Construction of wirelines is under way for more than 300 kilometers, with poles and wires in place for much of the way. The wirelines apparently will parallel supply and infiltration routes at a distance of a kilometer or more from the roads. The precise location of all of the lines is unclear, but the northern end of the network

seems likely to be near Route 101, about 30 kilometers north of the DMZ, where it would link up with the North Vietnamese wireline network. At the southern end, vegetation has been cleared all the way to the A Shau area and slightly beyond. Probably only a Sepone - Ban Bac segment of the network and a north-south line located east of Sepone are operational.

B. Capacity

The capacity of the roads in Laos and the distance that supplies can be moved forward by truck from North Vietnam is steadily increasing. In 1964, Route 15/12 through Mu Gia Pass was the only all-weather route available from North Vietnam into southern Laos. It had a capacity of about 400 tons a day during the dry season and 100 tons a day in the rainy season. At that time, trucks could move south to Muong Nong, a straight line distance of more than 150 kilometers from the Pass, during the dry season. During the rainy season, trucks could move only about 13 kilometers south from Mu Gia Pass. Thus most of the supply movements by truck into Laos took place during the dry season, supplemented by small movements over the trail network around the DMZ during the rainy season. Supply movements south of Muong Nong and east into South Vietnam were totally dependent on primitive transport.

After the major construction of the 1965/66 dry season a total of about 650 (dry season)/150 (wet season) tons a day could enter the Laos Panhandle on the two major access roads, and about 400/100 tons a day could be delivered by truck to several points within a few kilometers of the South Vietnamese border. About 150/30 tons of this total could be delivered about 500 kilometers south to the tri-border area. From these points along the border, primitive transport still had to be used for forward movements.

The routes constructed during the past year and the construction currently under way, however, will provide the Communists with a considerably higher capacity to move supplies by truck into Laos and from Laos into at least four major areas of South Vietnam located between the Khe Sanh area

and the tri-border area. When the third major access road into Laos is completed in the near future, the throughput truck capacity from North Vietnam via Laos into South Vietnam will be about 1,000 tons a day during the dry season and 200 tons a day in the rainy season. The only restricting sector in this pipeline will be Route 92/96 in the southern part of the Panhandle, which limits the movement to the tri-border area to about 200/50 tons a day.

C. Operation of the Transport System

The Laotian supply system is an extension of the North Vietnamese logistical supply system. The North Vietnamese Ministry of National Defense establishes general policies for the procurement of supplies destined to transit Laos, and its General Directorate of Rear Services (GDRS) is responsible for detailed planning and supervision of procurement, storage, issue, and distribution of supplies. The movement of supplies into Laos is controlled by the Transportation Directorate, GDRS, which also furnishes vehicles to units that need them, and North Vietnamese trucks move directly to supply depots in Laos. Transportation in the Communist part of southern Laos is primarily the responsibility of the 559th Transportation Group. This group has two main subordinates: the 70th Transport Regiment, which is responsible for transportation from the Mu Gia area south to the A Shau Valley area and Route 92, and the 71st Transport Regiment, which is believed to be responsible for transportation in the rest of the Panhandle area.

Most supplies are moved at night by truck into base areas and other smaller storage areas located only a few kilometers apart. The trucks travel about eight hours a night at about 10 kilometers an hour with little or no lights. The trucks are probably loaded and fueled in the late afternoon and unloaded, drained of fuel, and camouflaged early the next morning to counter air attacks during the daylight hours. Porters and other forms of primitive transport are used when trucks are not available or cannot be used because of poor road conditions.

D. Traffic Flows

The daily volume of goods delivered from North Vietnam into the Panhandle has increased markedly during the last three years, as shown in the tabulation below. The increase was especially high in the first quarter of 1968, an estimated 90 percent greater than during the same period last year. Preliminary data for April indicate that traffic may have increased again, by as much as 40 percent above the March level.* There are indications, however, that some of the trucks moving south in recent months have carried troops instead of cargo.

Year	Tons Per Day	Percent Increase Over Previous Year
1965	35	
1966	75	114
1967	95	27

The above estimates are based on roadwatch team reports of trucks counted moving south toward Mu Gia Pass on Route 15. During 1967, for example, an average of 17 trucks a day moved into southern Laos over Route 15. If each truck carried an average load of 3 tons of supplies, then more than 50 tons of supplies would have been moved daily on this route. During 1967 there were no roadwatch teams consistently reporting on traffic movements on Route 137. However, if Route 137 was used to the same percent of its capacity as was Route 15 -- an assumption supported by pilot sightings of traffic on Route 137 -- then about 35 tons per day would have entered Laos over this route. An average of 8 tons a day was believed to have been delivered over trails around the DMZ.

* *Reporting for the first time in over a year from a team located along Route 912 covering about three days in March and most of April indicates that truck traffic on this second major access route may not have been as high since the beginning of 1968 as has been estimated. However, this team is located about 3 kilometers from the road and, therefore, may not be able to see or hear all the truck traffic moving past it on the road. There is ample other evidence that the total traffic into Laos has been increasing throughout this dry season. Furthermore, traffic during April is normally the highest of any month of the year, as preparations are made for the rainy season that usually begins in May.*

III. Air Attacks on the Logistics System

A. Truck Losses

The North Vietnamese have lost an estimated 5,300 trucks in Laos since 1965. Reported truck losses have increased dramatically since the fall of 1967 and have continued at a high level in the first quarter of 1968. Almost as many trucks were lost in the first quarter of this year as in all of 1967. During 1967, 22 sorties were flown for each truck destroyed, but since January 1968 the ratio has been 11 to 1. Estimates of the yearly losses in Laos are given in the tabulation below:

Year	Effective Truck Losses
1965	45
1966	1,153
1967	2,072
1968 (Jan-Mar)	2,039

a. To arrive at an estimate of effective truck losses in both North Vietnam and Laos, pilot reports are first adjusted to eliminate double counting. Then a deflation factor is applied to adjust for inaccuracies in the data and for the North Vietnamese ability to repair and rebuild trucks. Inaccuracies are caused by high aircraft speeds; poor visibility resulting from weather, smoke, and dust after attacks; night operations; and intense antiaircraft fire. The formula for computing effective losses used by CIA and DIA is as follows: 75 percent of those trucks reported destroyed and 25 percent of those reported damaged are considered to be effective losses and are deducted from the inventory. For 1966, however, the number of trucks reported destroyed and damaged was further deflated by a factor of 20 percent.

Some of the increase in truck losses is due to the high number of sorties flown at night, when the majority of the trucks are operating; the increased use of Forward Air Controllers in spotter aircraft; and the increased use of new technical devices to detect and attack trucks. The new technical devices (see the Appendix) have enabled aircraft to more effectively attack moving targets at night.

The unusually large number of trucks reported destroyed, however, particularly in the first quarter of this year, may be overstated. Part of the reported losses may be the result of changes in pilot criteria for reporting numbers of trucks destroyed, compared with the number damaged. In Laos during January-September 1967, 62 percent of the trucks were reported as destroyed, while 38 percent were reported as damaged. In North Vietnam the ratio has been about one to one. In the last quarter of 1967 and the first quarter of 1968 the ratio in Laos has changed to nine reported destroyed to one reported damaged. It is not clear why the ratio should have changed so dramatically, and it is possible that the formula (see the footnote to the tabulation above) for computing effective losses should be revised to further deflate pilot reports of enemy truck destruction. Many of the trucks reported destroyed or damaged by pilots were attacked at night, when it is extremely difficult to assess the effectiveness of an air attack.

Data from roadwatch teams also indicate that data on truck losses may be overstated. The team at Mu Gia Pass, one of the entrances to the road net in the Laotian Panhandle from North Vietnam, has reported slightly more than 3,700 trucks moving southbound and slightly fewer than 3,700 trucks moving northbound between October 1967 and March 1968; yet during the same period, 3,200 trucks were effectively lost according to pilot reports. Recent reports from roadwatch teams on Route 912, although incomplete, indicate that approximately the same volume of traffic on that route is moving northward as is moving south.

Furthermore, there has been no apparent shortage of trucks in either North Vietnam or Laos. Compared with reported losses of about 10,500 trucks in the two countries from 1965 through the first

quarter of 1968, imports of more than 13,000 trucks during the same period have increased the North Vietnamese truck inventory from about 9,000 trucks at the beginning of 1965 to more than 11,000 at the present. Each year, newer and larger trucks have been observed in Laos by roadwatch teams and in aerial photography. If truck losses have in fact increased sharply, the USSR and East European Communist countries could step up their supply of vehicles because production rates are ample.

B. Supply Losses

The total loss of supplies sustained by the Communists in Laos is now assumed to be about 20 percent of the tonnage delivered into Laos. In 1967, 8 percent of the supplies moved into the Laos Panhandle may have been lost as a result of the destruction of trucks, with about five trucks a day destroyed. If half of these trucks were loaded with three tons of supplies -- trucks delivering supplies would probably be fully loaded, trucks returning would probably be empty -- about 7.5 tons of supplies were destroyed daily, compared with the 95 tons of supplies moving into the Laos Panhandle. Daily destruction of trucks in the first quarter of 1968 has reportedly been four times the daily rate in 1967, raising the calculated losses of supplies to 30 tons a day, or 12 percent of the 240 tons of supplies per day estimated to have been moved into the Laos Panhandle during the same period. In addition to the direct loss of cargoes resulting from destroyed trucks, the Communists also suffer losses from air attacks on storage depots and base areas and suffer additional losses from pilferage, spoilage, or other normal causes. The above estimates of supply losses are extremely tenuous, however, because of the limited amount of intelligence available on losses.

C. Fixed Targets

During 1966 and 1967, pilots flying attack sorties over Laos reported destroying or damaging a total of about 24,000 fixed targets. More than one-third were roads cratered or cut, one-quarter were buildings, one-quarter were ammunition and supply areas and miscellaneous targets, and the remainder were weapons, bridges, and tunnels.

Numbers of each type of fixed target reported by pilots to be destroyed or damaged in Laos during 1966 and 1967 are given in the following tabulation:

	1966	1967	Total	Percent
Road craters or cuts	4,146	4,605	8,751	37
Buildings	4,731	1,758	6,489	27
Ammunition and supply areas and miscellaneous	3,294	2,186	5,480	23
Bridges and tunnels	1,258	397	1,655	7
Weapons	536	855	1,391	6
Total	*13,965*	*9,801*	*23,766*	*100*

Attacks against fixed targets have had little lasting effect on the logistics system. There has been a sharp decrease in the number of buildings, storage areas, and bridges attacked in 1967 compared with 1966, reflecting the inability of pilots to find suitable targets under the jungle canopy. Road cuts and craters -- about one cut or crater daily per 150 kilometers of road in the Panhandle during 1967 -- have not seriously impeded traffic flows, and the roads have been quickly restored.

D. Increased Air Attacks

An increase in attack sorties over Laos made possible by a cessation in the bombing of North Vietnam would increase the cost and complicate the movement of supplies through Laos; however, it would not likely be any more successful than previous attacks in reducing the flow below that needed to maintain enemy forces in South Vietnam at present or even increased rates of combat. Bridges, buildings, and storage areas would be more heavily attacked, but Laos has a small and declining number of significant fixed targets that are susceptible to detection and attack from the air. Even if the unusually high reported loss rate of trucks in the first quarter of this year is accurate and is sustained, losses of

trucks and supplies could be made up by increasing the volume of traffic, by bringing in more trucks from North Vietnam, and by importing additional trucks from the USSR and Eastern Europe. Transport routes have considerable excess capacity -- the road network has not often been used to more than 15 percent of capacity in the past -- and even with increased bomb damage, the network could support increases in traffic flows caused by the need to make good a greater loss of supplies, increased consumption within Laos, or higher levels of combat in South Vietnam. The rudimentary road system is easily repaired, and the present repair force could be quickly augmented by relocating repair crews idled by a bombing pause in North Vietnam. Furthermore, an increase in air attacks would almost certainly be countered by an increase in air defenses, which would lower the accuracy of attacking aircraft.

IV. Personnel Infiltration System in Southern Laos

A. Infiltration Intelligence

Intelligence on the numbers and timing of North Vietnamese infiltration of troops through Laos into South Vietnam is limited but improving.

Aerial photography and air observers are of little help in providing additional evidence of infiltration because the trails used are covered by the jungle canopy. Friendly guerrilla teams occasionally report troop movements in the Laos Panhandle but can provide few details. Consequently,

Most of the intelligence on the infiltration network has been derived from captured documents and prisoner interrogations; this information is still somewhat limited, however, because of the compartmentation applied to all phases of the infiltration system. For example, prisoners have reported that way stations on the infiltration trails are usually located about a kilometer away from the bivouac areas used by the infiltrating troops. Apparently, only the commanding officer, communications personnel, and occasional supply carriers from the infiltrating groups are permitted to go to these base areas. The same principle is applied in keeping base personnel at adjacent way stations from knowing the locations of each other's sites. Those who are assigned to guide infiltration groups customarily meet their opposite numbers from the next station at some intermediate point along the trail and pass over control of the groups at that time. Nevertheless, a good deal has been learned about the infiltration network from captured documents and personnel.

B. Infiltration Network

All infiltration groups transiting Laos are supported and controlled by an effective organization of administrative, logistic, communications, and transport personnel. This system extends over a complex network of trails as far south as the delta region below Saigon, through lengthy portions of eastern Laos and Cambodia, and extreme western South Vietnam.

Way stations are scattered along all the infiltration trails at intervals of about a day's march. In much of North Vietnam these stations are established in or around villages or hamlets, but, as the infiltration routes approach the North Vietnamese border and pass into Laos, sites are selected in remote jungle areas. Way stations have two major functions: to provide rest and replenishment areas for infiltrating personnel and a base for the individuals who control and support the infiltrators. The stations vary in their facilities

from mere stopping points in the jungle to major depots equipped to provide food, shelter, and medical care.

The infiltration network is highly efficient. Small craft are provided at every water way which the infiltrators cannot ford. Prisoners have reported little delay or confusion at these potential bottlenecks and have remarked on the competence of the network personnel.

C. Level of Infiltration

Hanoi probably has committed more than a quarter of a million men to the conflict in the south,

It is not known how many of these troops have actually transited Laos.

Infiltration groups have ranged in size from about 20 to 2,000 men. The small groups probably are composed of personnel whose unique training or responsibilities justify the formation of a special infiltration unit. The larger units appear to be made up of regular army formations or groups of unassigned replacement personnel. The typical infiltration group is battalion size -- about 400 to 500 men. This figure probably represents a practical number in moving personnel on the infiltration trails and suggests that large groups are subdivided into marching elements of about this size. In the case of a regular North Vietnamese battalion, the component companies appear to move separately at intervals of a few kilometers between each unit. Infiltrating battalions are normally separated by at least a day's march.

The infiltrators are usually not accompanied or supported by supply vehicles on the trip south. Bicycles may, however, be employed to carry some items of heavy equipment, such as communications gear. Each man carries his own food, medicine, field equipment, and weapons and is periodically resupplied from depots along the route of march. The infiltration groups are kept apart from the supplies that they will eventually use in South Vietnam.

D. Method of Movement

The great majority of the infiltrating personnel have proceeded on foot, [redacted] prisoner interrogations have suggested that a substantial percentage of the infiltration during the first quarter of 1968 has been accomplished by truck. Over the years, however, infiltration by vehicle has been confined to high-ranking cadre or individuals with special skills -- such as medical or weapons technicians. Prisoners have indicated that infiltration by truck can be accomplished in two weeks or less; by foot, at least six to eight weeks are required. Infiltrators shift from a night to a day march schedule on entering Laos from North Vietnam, probably because US air interdiction efforts are less intense in Laos and because of the concealment afforded by heavy jungle growth in this region. The group normally sets out about 0600 and will march for about six to nine hours, depending on terrain.

Every effort is made to conceal the presence of the unit. For example, temporary planking is used when crossing dirt roads in order not to leave footprints. Infiltration groups are careful to keep away from main lines of communications in Laos. Prisoners have reported hearing supply trucks on parallel routes, but for the most part, the infiltrators move on trails which are a safe distance from the often-bombed supply roads.

E. Attrition

Infiltrators face a variety of perils on the way south. Malaria is the most frequent problem encountered by the infiltration groups. Reports from captured troops indicate that among some groups as many as 100 percent of the infiltrators contract this disease in varying intensity at some point during the march south. Each man is supplied with anti-malaria medication, however, and most are able to complete the trip. Dysentery, beri-beri, and respiratory diseases also are reported to plague the infiltrators. Morale declines in response to the increasing hardships as the troops move south, particularly during the rainy season. The proportion of personnel lost en route varies widely, captured documents and prisoners reporting from 5 to 50 percent. It is likely, however, that very few casualties

are permanent and that after a period of recuperation or re-indoctrination, the detained individuals join another group and continue south.

V. Attacks on the Personnel Infiltration System

Air strikes in Laos have not had an appreciable effect on personnel infiltration, and intensifed air strikes are not likely to. Air harassment has probably indirectly increased the sickness and desertion rates. Several prisoners of war have recounted being bombed by US aircraft. Air attacks on occasion may have made the resupply of food and medicines to way stations in Laos difficult. However, interrogation of infiltrators who traversed the trails during 1967 indicates that a small number of those leaving North Vietnam became casualties of air strikes.

APPENDIX

New Detection Systems In Laos

Several new detection systems recently introduced in Laos have significantly increased the cost to the enemy of moving supplies from North Vietnam to the south. Most enemy traffic in Laos moves by truck at night, and previously with little risk of detection and destruction. These new devices have enabled Allied air operations to increase the detection and destruction of trucks and other logistics targets at night.

1. Starlight Scope

The Starlight Scope is a device used for night observation which passively captures and intensifies ambient light emitted from the sky, ground, and general surroundings without emitting any light itself. It does not see through direct obstacles to vision such as low clouds, jungle canopy, and terrain features such as hills and trees and can be limited in effectiveness by small differences in contrast between target and background. The smallest and most common model of the Starlight Scope weighs six pounds and is about one-half meter in length. It has a field of view of 10 degrees and is capable of identifying a human-sized figure at 400 meters. The Scope may be attached to a rifle or used as a hand-held observation piece. The most fruitful application of the Starlight Scope has been in Forward Air Control missions in the Laos Panhandle where it has played an important role in the recent increase in sightings and destruction of enemy trucks. The Scope is in use as a hand-held observation piece by all Forward Air Controllers in the Steel Tiger area. Starlight Scopes also have been provided to roadwatch teams and to some armed helicopters.

2. Night Observation Device

The Night Observation Device is used aboard C-130 aircraft and armed helicopters. It weighs forty pounds, is mounted on a tripod, has a range of up to 1,000 meters on a moonless night, and

provides better resolution and a larger optical gain than the Starlight Scope. The effectiveness of the Device is enhanced on C-130 aircraft by the presence of other equipment such as a Xenon searchlight capable of providing light in the ultraviolet and infrared spectrums as well as the visible spectrum. This enables the Device, with its limited field of view, to be trained more quickly on suspect targets. Only small quantities of the Night Observation Device are currently available, but production is now being accelerated. The Device is not used on high-performance jet aircraft because its effectiveness would be limited by the speed and altitudes of these aircraft, the visibility limitations imposed by canopies, the small field of view of the Device, and the need for viewing through an eyepiece.

3. Low-Light-Level Television

The Low-Light-Level Television (LLLTV) consists of a light intensifier tube similar to that used in the Starlight Scope connected to a TV camera tube with a standard TV display. The LLLTV has a 20-degree field of view -- double that of the Starlight Scope. The TV screen is a more convenient viewing mode than the eyepiece of the Starlight Scope, although it has a slightly degraded image compared with the Starlight Scope. The TV apparatus can be tied in with a camera and is particularly useful in conjunction with fire-control equipment. The LLLTV system is currently in use on three B-57's flying missions over Laos and South Vietnam. An LLLTV system with a longer range and an improved image display is planned for installation on some sixteen B-57's by March 1969. An improved system is also planned for installation with a fire-control system on several UH-1 helicopters in 1969.

4. Aerial Surveillance Device

The Aerial Surveillance Device will, when deployed, augment a Starlight Scope or LLLTV on helicopters; it will utilize a pulsed laser illuminator to provide better target contrast when a target is viewed through a Scope or on a TV screen. Some three or four devices are expected to be in operation soon.

5. Infrared Sensors

New infrared sensors permit fast detection by aircraft of heat-emitting vehicles and campfires. Earlier infrared systems did not provide advance notice of targets being approached by high-speed aircraft because the detection systems were aimed directly downward and had to photograph infrared emissions before alerting pilots to targets. Current systems are "forward looking" and provide immediate target information to pilots. The system's effectiveness is limited over heavy jungles and by occasional incorrect target identification caused by emissions of heat from land masses or bomb craters.

6. HARK-1

HARK-1 is a radio-counter used by indigenous, non-English-speaking roadwatch teams in Laos to notify Allied forces of the type and quantity of observed enemy traffic. The observer turns picture-labeled knobs, pushes a button, the device relays information to a plane flying on station, and equipment on the plane relays the information to a teleprinter at a ground station. About 200 of these units have been made available to roadwatch and guerrilla teams operating in Laos and South Vietnam.

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